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SOURCE V. A. Gilyarovskiy et al, Electroson (Electrically Induced Sleep), Medgiz,
 1953, Moscow, 127 pp.

CURRENT SOVIET RESEARCH ON THE CLINICO-PHYSIOLOGICAL
 ASPECTS OF ELECTRICALLY INDUCED SLEEP

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[The following selected excerpts are taken from "Electroson"
 (Electrically Induced Sleep), Medgiz, Moscow, 1953, 127 pages. The
 book is a survey of current Soviet clinical and physiological re-
 search in the field of electrically induced sleep which is produced
 by the action of a weak current. Previously the research emphasis was
 on electronarcosis, which is induced by a strong current. The research
 is being carried out under the auspices of the Institute of Psychiatry
 of the Ministry of Health of the USSR. The preface of the book and a
 section entitled "Concluding Remarks" are translated in full. It is
 felt that these two sections and selected portions of the Introduction
 adequately summarize the contents of the book. The Table of Contents
 is also included in order to indicate the scope of the book. The sub-
 jects mentioned in these excerpts are discussed in greater detail in
 the book, which is illustrated by photographs, sketches, charts, and
 diagrams. Case histories are given of patients treated by electri-
 cally induced sleep for various mental disorders.]

The following notice, which is an indication of the experimental
 status of this work, appears on the second page of the book. "This
 book contains factual material pertaining to the development of a new
 therapeutic procedure which may find application in clinical work.
 Nevertheless, Medgiz [State Medical Publishers] considers it necessary
 to direct the attention of all readers to the fact that, as the authors
 indicate, this procedure still requires further investigation."

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C-O-N-F-I-D-E-N-T-I-A-LPreface

This book reports the results of a definite stage in the investigations of mental therapy, which have been conducted since 1947 by personnel of the Institute of Psychiatry of the Ministry of Public Health of the USSR (formerly an Institute of the Academy of Medical Sciences).

Sleep therapy, which is based theoretically on I. P. Pavlov's principle of protective inhibition, is being practiced on an ever increasing scale. This is explained by the fact that barbamy and the other sleep inducing substances, in use at the present time, possess a significant degree of toxicity that sometimes leads to complications. Naturally it would seem to be important to develop a method of sleep therapy which would not necessitate the introduction of drugs into the body of the patients undergoing treatment. The authors directed their attention to the possibility of utilizing an electric current to induce sleep. Soviet investigators have done extensive research on the effect of electrical currents on the nervous system. It is sufficient to mention the work of I. M. Sechenov: using the very imperfect apparatus of that period, he established the existence of fluctuations of electric potentials which occur in the central nervous system. In addition I. M. Sechenov was the first person to bring about the inhibition of the spinal reflexes of a frog by the action of an induction current on its optic protuberances.

Inasmuch as investigations of so-called electronarcosis, which is produced by the action on the brain of comparatively strong electric currents possessing various characteristics, have been conducted for a long time, we too began our investigation with a study of electronarcosis. We investigated the effects of electric currents possessing different characteristics on the course of mental illnesses. In this book it is shown why the authors rejected this method and devoted all their attention to conditions which they call electrically induced sleep. Using this type of sleep the authors achieved beneficial results. They do not consider their investigations conclusive however, and publish their results in order to attract attention to this method. The procedure used to induce a state of sleep needs further development. There is a special need for serious clinical study of the effects of electrically induced sleep on the course of various illnesses. Such a study can conclusively determine its effectiveness, its field of application, and the possibilities of using it in conjunction with other therapeutic measures. The authors' investigation is not only a collective effort, but a many-sided one as well. In this case, an exact determination of the nature of the condition, which is designated as electrically induced sleep, is of considerable importance. It was very important to establish the comparative similarities and differences between this condition and physiological, hypnotic, and pharmacological sleep. In the light of these modifications, the authors also studied deviations in the clinical picture.

M. H. Livanov and T. A. Kopol'kova of the Electrophysiological Laboratory and S. A. Biryukov and Yu. Ye. Segal' of the Laboratory of Higher Nervous Activity of the Institute [of Psychiatry] took part in this work.

N. M. Liventsev was responsible for most of the theoretical development and the creation of the necessary apparatus. The clinical study was conducted by Z. A. Kirillova, Z. A. Ven'yeri, T. P. Simson, A. N. Korganova, and M. V. Korkina. The work was under the general direction of V. A. Gilyarovskiy.

The apparatus was developed in cooperation with the Physicotechnical Division (headed by A. N. Obrosof) of the State Institute of Physiotherapy (directed by A. I. Nesterov).

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C-O-N-F-I-D-E-N-T-I-A-LIntroduction

[The introduction begins with a comment to the effect that this work is based on the "materialistic ideas of our outstanding physiologists I. P. Pavlov and N. Ye. Vvedenskiy". The following paragraph on page 9, summarizes these materialistic ideas:]

I. P. Pavlov said, "there are three types of external stimulation which directly cause a state of inhibition in the cerebral cortex: very weak, very strong, and unusual stimulations." (I. P. Pavlov, "Polnoye Sobraniye Trudov," Full Collection of Works, published by the Academy of Medical Sciences of the USSR, 1947, Vol IV, page 320.) In another place he stated: "Excessive [zapredel'noye - beyond a certain limit] inhibition arises either as a result of a very strong conditional stimulation, or as a result of the cumulative effect of a number of stimulations which, individually, are not very strong." (Ibid, Vol III, page 566). We therefore conducted our investigations along two lines: (1) A weak current was used to induce a state of inhibition in the cerebral cortex. This state, as far as can be discerned, develops into sleep. (2) A strong current was used to cause parabolic or, according to Pavlov's usage, excessive inhibition.

[The remainder of the introduction is a summary of recent Soviet work on this subject.]

Inasmuch as all the Soviet researchers who worked in this field before us, i. e., V. Yu. Chagovets, I. A. Golyanitskiy, L. L. Vasil'yev, G. S. Kalendarov, V. A. Glazov, F. P. Petrov, I. I. Yakovlev and others, based their investigations on Vvedenskiy's theory of parabolic inhibition, and worked on electronarcosis caused by the application of strong currents, we too started out in this direction. Using the apparatus designed by the Physicotechnical Division of the State Institute of Physiotherapy, we studied the peculiarities of the state of electronarcosis produced by modifications in the characteristics of the pulse current. The duration of the pulses varied from 0.0001 to 0.01 seconds and the frequency from 100 to 300 cycles per second, using a square wave form. Without going into a detailed analysis of this problem, we will point out only that the most effective current characteristics for producing electronarcosis were a pulse duration of 0.0002-0.0005 seconds and a frequency of 100 cycles per second. We used a current with these characteristics in our work.

Parallel to our observations on the dynamics of the psychopathological state, we began an investigation of its objective indexes. To do this, we used M. H. Livanov's method of electroencephalography and E. Ya. Skuin's method of biochemical analysis. On the basis of preliminary data worked out from electroencephalograms, it was possible to establish that the indexes confirmed the presence of parabolic inhibition in the cerebral cortex directly after the action of the pulse current. Variations in the biocurrents as shown by the graph, in the cases investigated, were found to agree with variations in the dynamics of the clinical picture.

A study of the data pertaining to the carbohydrate and protein metabolism of patients undergoing treatment by electronarcosis showed that there were no pathological shifts in the metabolism either during or after the application of the current. During electronarcosis, the sugar content of the blood increased slightly, reaching 120-130 mg percent. The lactic acid and pyruvic acid content varied within narrow limits. The protein content of the blood during electronarcosis was insignificantly lowered; it went from 8.6 to 8 mg percent.

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It should be noted that these shifts in metabolic processes are considerably smaller than those encountered in connection with the application of an electric current in electric shock therapy.

Our investigations indicated the possibility, on the one hand, of bringing about prolonged electronarcosis in human beings and, on the other, of using this procedure in the clinic to treat schizophrenia, especially its catatonic form. We turned our attention, however, to several complications which arise when this procedure is used in the clinic; for example, (1) the occurrence of a "hyperkinetic" reaction which, in a number of cases, produced a state of excitement in the patient and (2) unpleasant sensations which occurred in a number of patients, especially during prolonged applications, when consciousness was maintained.

It was characteristic that many patients, who at the beginning of treatment were in a state of excessive inhibition and did not react visibly to the application of current, refused to be subjected to the electronarcosis procedure as their state of inhibition became relaxed.

Having studied the clinical picture and the therapeutic effect of electronarcosis in the treatment of schizophrenia, we became dissatisfied with the results achieved by this method. Therefore we turned to the second possible means of solving the problem, which was to study the application of a weak current that would cause neither painful nor unpleasant sensations.

V. A. Gilyarovskiy advanced the proposition that the application of even a very weak pulse current of the necessary frequency would prove to be effective in causing physiological sleep or a state approximating it.

By applying a weak dose of a pulse current with a frequency of 1-10 cycles per second through electrodes brought into contact with the eyes and the nape of the neck, we succeeded in achieving a somnolent state and, under the proper conditions of quietude and a comfortable position, the patient was induced to sleep. This state was produced with minimal application of current, and caused no disagreeable sensations or any other visible reactions in the patients.

Having ascertained the innocuousness of this procedure by a number of experimental applications both on patients and ourselves, we decided to study it at the clinic.

Concomitant to the investigation of electrically induced sleep for the treatment of various forms of mental diseases, we carried out investigations which made it possible, to a certain degree, for us to arrive at some conclusions concerning the physiological nature of this state.

Observations carried out at the Institute of Psychiatry and a number of other institutions made it possible to establish that there is a specific effectiveness of electrically induced sleep in the treatment of neuroses, reactive and asthenic conditions, certain organic diseases of the central nervous system (encephalites), and many different forms of schizophrenia.

On the basis of a review of the material presented by us, the presidium of the Scientific Medical Council of the Ministry of Health USSR resolved on 8 July 1952:

1. To allow the use of electrically induced sleep in the treatment of diseases in which sleep therapy is indicated, according to I. P. Pavlov.
2. To confirm instructions on the use of electrically induced sleep in the treatment of certain illnesses.
3. To intrust to the Technical Council of the Ministry of Health USSR the task of resolving the question of suitable apparatus for carrying out this type of medical intervention.

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Some of the further tasks which we and other psychiatric institutions, basing their work on our experience, will have to perform are:

1. Explanation of the physiological characteristics of electrically induced sleep and of the mechanism of the action of a pulse current on the central nervous system.
2. Formulation of a basis for and indication of the most efficient procedure for the utilization of electrically induced sleep.
3. Study of the clinical modifications which occur in different groups of patients due to the effects of electrically induced sleep, explaining the mechanism involved in each instance.
4. Formulation of indications for the therapeutic use of electrically induced sleep.
5. Determination of the possibility of using it in combination with other methods, such as the application of drugs, hypnosis, insulin therapy, etc.
6. Determination of its significance in solving the general problems of psychopathology.

Concluding Remarks

Electrically induced sleep is a state of somniferous inhibition, arrived at by the use of an electric current. In its present form it is one more weapon in the arsenal of therapeutic remedies. We consider it necessary to make a strict differentiation between electrically induced sleep, which we have been studying since 1947, and electronarcosis, which we also studied earlier.

Electronarcosis is produced by a comparatively strong current and causes strong sensations which do not abate until the following day. In order to produce electrically induced sleep, a special apparatus was developed which causes a rhythmic stimulation that induces inhibition of the cerebral cortex.

The construction of the electrodes and their points of application were of great importance. In our investigations we found that the most efficient procedure consists of placing one electrode over the eyesocket and the other on the nape of the neck. This makes it possible to obtain a sleep-inducing effect with a weak current and without any kind of an unpleasant sensation.

We devoted a great deal of attention to determining the physiological mechanisms involved in electrically induced sleep. It is possible to conjecture that our patients simply fell asleep in a perfectly normal manner when they were placed on the bed, or that suggestion played a part in their falling asleep since they knew that sleep would help to cure them. We observed, however, that schizophrenics fell asleep in a large percentage of cases, and it is a well-known fact that such patients rarely succumb to suggestion. Furthermore physiological investigations indicated a distinction between electrically induced sleep and hypnotic sleep. This distinction was especially apparent in the investigation of electrical activity even though, by comparison, the changes in this case were less intensive than those observed during narcotic sleep and lasted for a shorter time. After electrically induced sleep, dreams were sometimes recalled and it was not by chance that the content of these dreams was peaceful and pleasant even in those patients who usually had nightmares during nocturnal sleep.

At present we are of the opinion that we have succeeded, with the help of a specially constructed apparatus, in producing an electric current which makes it possible to induce a state of sleep, approximating physiological sleep. At this stage in the development of our method, sleep can not be induced in every instance, and we are not able to arbitrarily control its duration. However, in the majority of cases, sleep does occur.

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It must be emphasized that during electrically induced sleep therapy no complications whatsoever are observed, and the organism endures nothing which can have a harmful effect upon it. As in other varieties of sleep therapy, conditioned reflex relationships arising as a result of it are of importance. For example a woman schizophrenic, who was treated by Doctor M. V. Korkina using electrically induced sleep, is a clear illustration of this phenomenon. After her discharge from the hospital, this patient was able to reproduce the external features of an electrically induced sleep treatment at home by lying on the bed, binding her head, and placing a towel over her eyes. When she did this she perceived a sensation of rhythmic vibrations, similar to that produced by the electric sleep apparatus, and fell asleep. It is a well-known fact that a conditioned reflex mechanism also plays an important role in natural, hypnotic, and pharmacological sleep.

The question of combining electrically induced sleep therapy with certain soporifics or hypnotics is very important. From a pharmacological standpoint, such a combination would act synergistically and would increase the effect of the electric current.

Our preliminary data on the positive effect of a combination of electrically induced sleep and caffeine is especially interesting. Our next task will be an investigation of the effect of a combination of electrically induced sleep with microdoses of bromides.

The electrically induced sleep method has passed through the period of experimental development, and has reached a point where it can be introduced into psychiatric institutions for further study and final perfection.

During the past two years, we have repeatedly demonstrated the apparatus used for electrically induced sleep to psychiatrists working in various psychiatric institutions in the Soviet Union, and at their requests have given them a description of the apparatus and instructions for using it.

In the Moscow Oblast Psychiatric Hospital imeni V. I. Yakovleva, where the chief physician is V. V. Chentsov, electrically induced sleep therapy conducted according to our method has been carried out systematically since 1951. Observations on 60 patients, the overwhelming majority of whom were schizophrenics, have been made by M. I. Rybal'skiy and M. A. Titayeva. The results obtained by the use of electrically induced sleep at this hospital are very similar to those which we observed.

In Kiev, in the Division of Psychiatry (headed by V. P. Protorenko, an active member of the Academy of Sciences of the Ukrainian SSR) of the Institute of Clinical Physiology of the Academy of Sciences of the Ukrainian SSR, both our procedure for applying electrically induced sleep and a procedure which they developed are used. Their procedure consists of using the conditioned reflex relationships which have developed as a result of the repeated action of a pulsating current. Observations conducted by S. D. Rasin and R. A. Vernikova have shown that electrically induced sleep has sufficient effectiveness, especially in the treatment of patients with reactive conditions. Improvement was also observed during the treatment of patients suffering from schizophrenia.

Electrically induced sleep, as a method of therapy, is based on the beneficial properties of protective inhibition. As in the case of pharmacological sleep therapy, electrically induced sleep therapy was used first on mental patients. Undoubtedly, electrically induced sleep should gradually find applications in other fields just as the pharmacological methods of sleep therapy have done.

We also did some work in conjunction with the Institute of Obstetrics and Gynecology of the Ministry of Health of the USSR (Head of the Clinic, Prof G. M. Salganik). Electrically induced sleep was used in the treatment of the toxic

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conditions of early pregnancy. In our opinion, the mechanism by which electrically induced sleep acts in this case may be due to the amelioration or complete interruption of the pathological interoceptive stimulations, which play a great part in causing nausea, vomiting, or an excessive flow of saliva. Furthermore, the protective inhibition of the cortical cells protects them from destruction by preventing further intoxication. The first observations of 15 patients have shown that electrically induced sleep has a significantly positive effect. Besides the alleviation of specific toxic symptoms, there was improvement in the mental condition of the patients, which in the majority of cases took the form of an asthenodepressive syndrome. Improvements usually became evident after the fourth or fifth treatment [literally: "seance"]. Each successive treatment then strengthened the beneficial changes which had occurred. Depending upon the rapidity with which the positive effects appeared, the various patients underwent from 9 to 18 treatments.

Docent L. F. Limcher and Doctor Ye. A. Beyul of the Cardiological Clinic of the Institute of Nutrition have begun to investigate the therapeutic application of electrically induced sleep in the treatment of hypertension and gastrointestinal ulcers.

The action of a pulsating current on the cerebrum has been successfully applied by Prof O. M. Vil'shur of the Neurological Clinic of the Institute of Physiotherapy in the treatment of the sequelae of traumatic affections of the central nervous system.

We have established the complete innocuousness of electrically induced sleep by a series of introspective observations.

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